Complete Summary

GUIDELINE TITLE

ESC guidelines for the diagnosis and treatment of acute and chronic heart failure 2008.

BIBLIOGRAPHIC SOURCE(S)

Dickstein K, Cohen-Solal A, Filippatos G, McMurray JJ, Ponikowski P, Poole-Wilson PA, Stromberg A, van Veldhuisen DJ, Atar D, Hoes AW, Keren A, Mebazaa A, Nieminen M, Priori SG, Swedberg K, ESC Committee for Practice Guidelines (CPG), Vahanian A, Camm J, De Caterina R, Dean V, Dickstein K, Filippatos G, Funck-Brentano C, Hellemans I, Kristensen SD, McGregor K, Sechtem U, Silber S, Tendera M, Widimsky P, Zamorano JL, Document Reviewers, Tendera M, Auricchio A, Bax J, Bohm M, Corra U, Della Bella P, Elliott PM, Follath F, Gheorghiade M, Hasin Y, Hernborg A, Jaarsma T, Komajda M, Kornowski R, Piepoli M, Prendergast B, Tavazzi L, Vachiery JL, Verheugt FW, Zamorano JL, Zannad F. ESC guidelines for the diagnosis and treatment of acute and chronic heart failure 2008: the Task Force [trunc]. Eur Heart J 2008 Oct;29(19):2388-442. [252 references] PubMed

GUIDELINE STATUS

This is the current release of the guideline.

This guideline updates previous versions: Task Force on Acute Heart Failure of the European Society of Cardiology. Guidelines on the diagnosis and treatment of acute heart failure. Sophia Antipolis (FR): European Society of Cardiology; 2005. 36 p.

Swedberg K, Cleland J, Dargie H, Drexler H, Follath F, Komajda M, Tavazzi L, Smiseth OA, Gavazzi A, Haverich A, Hoes A, Jaarsma T, Korewicki J, Levy S, Linde C, Lopez-Sendon JL, Nieminen MS, Pierard L, Remme WJ. Guidelines for the diagnosis and treatment of chronic heart failure: full text (update 2005): The Task Force for the Diagnosis and Treatment of Chronic Heart Failure of the European Society of Cardiology. Sophia Antipolis (FR): European Society of Cardiology (ESC); 2005. 45 p.

**** REGULATORY ALERT ****

FDA WARNING/REGULATORY ALERT

Note from the National Guideline Clearinghouse: This guideline references a drug(s) for which important revised regulatory and/or warning information has been released.

- December 16, 2008 - Antiepileptic drugs: The U.S. Food and Drug Administration (FDA) has completed its analysis of reports of suicidality (suicidal behavior or ideation [thoughts]) from placebo-controlled clinical trials of drugs used to treat epilepsy, psychiatric disorders, and other conditions. Based on the outcome of this review, FDA is requiring that all manufacturers of drugs in this class include a Warning in their labeling and develop a Medication Guide to be provided to patients prescribed these drugs to inform them of the risks of suicidal thoughts or actions. FDA expects that the increased risk of suicidality is shared by all antiepileptic drugs and anticipates that the class labeling change will be applied broadly.
- July 31, 2008 - Erythropoiesis Stimulating Agents (ESAs): Amgen and the U.S. Food and Drug Administration (FDA) informed healthcare professionals of modifications to certain sections of the Boxed Warnings, Indications and Usage, and Dosage and Administration sections of prescribing information for Erythropoiesis Stimulating Agents (ESAs). The changes clarify the FDA-approved conditions for use of ESAs in patients with cancer and revise directions for dosing to state the hemoglobin level at which treatment with an ESA should be initiated.

COMPLETE SUMMARY CONTENT

SCOPE

DISEASE/CONDITION(S)

- Acute heart failure
- Chronic heart failure
- Atrial and ventricular arrhythmias
- Comorbidities in patients with heart failure: hypertension, diabetes mellitus, renal dysfunction, chronic obstructive pulmonary disease, anemia, cachexia, gout, congenital heart disease

GUIDELINE CATEGORY

Diagnosis
Evaluation
Management

Risk Assessment
Treatment

CLINICAL SPECIALTY

Cardiology
Critical Care
Emergency Medicine
Family Practice
Geriatrics
Internal Medicine
Pulmonary Medicine

INTENDED USERS

Advanced Practice Nurses
Health Care Providers
Nurses
Pharmacists
Physician Assistants
Physicians

GUIDELINE OBJECTIVE(S)

To provide practical guidelines for the diagnosis, assessment, and treatment of acute and chronic heart failure

TARGET POPULATION

Adults with acute or chronic heart failure

INTERVENTIONS AND PRACTICES CONSIDERED

Chronic Heart Failure

Diagnosis/Evaluation

1. Clinical examination (assessment of signs and symptoms of heart failure)
2. Chest x-ray
3. Laboratory tests, including natriuretic peptides, troponins, neurohormonal markers
4. Echocardiography
    - Assessment of left ventricular diastolic function
    - Assessment of heart failure with preserved ejection fraction (HFPEF)
    - Transoesophageal and stress echocardiography
5. Additional imaging tests
    - Cardiac magnetic resonance imaging (CMR)
    - Computed tomography (CT) scan
    - Radionuclide ventriculography
    - Pulmonary function tests
    - Exercise testing

- Ambulatory electrocardiogram (ECG) monitoring (Holter)

6. Cardiac catheterization (coronary angiography, right heart catheterization, endomyocardial biopsy)
7. Prognostic assessment

Management/Treatment

1. Non-pharmacological management (self-care management)
    - Patient education (e.g., risk factor modification, diet and exercise recommendations)
2. Pharmacological therapy
    - Angiotensin-converting enzyme inhibitors (ACEIs)
    - Beta-blockers
    - Aldosterone antagonists
    - Angiotensin receptor blockers (ARBs)
    - Hydralazine and isosorbide dinitrate
    - Digoxin
    - Diuretics (loop, thiazides, potassium-sparing)
    - Other drugs to treat cardiovascular co-morbidities (anticoagulants, antiplatelets, statins)
3. Devices and surgery
    - Revascularization procedures (coronary artery bypass grafting, percutaneous coronary intervention)
    - Evaluation for coronary artery disease (coronary angiography)
    - Detection of viable myocardium
    - Valvular surgery (aortic valve surgery, mitral valve surgery)
    - Pacemakers; cardiac resynchronization therapy
    - Implantable cardioverter defibrillator (ICD)
    - Heart transplantation
    - Ventricular assist devices, artificial hearts
4. Management of arrhythmias (atrial fibrillation, ventricular arrhythmias)
5. Management of co-morbid diseases (hypertension, diabetes mellitus, renal dysfunction, chronic obstructive pulmonary disease, anemia, cachexia, gout)
6. Management of adults with congenital heart disease
7. Management of the elderly

<u>Acute Heart Failure</u>

Diagnosis/Evaluation

1. ECG
2. Chest x-ray
3. Arterial blood gas analysis
4. Laboratory tests (e.g., complete blood count, sodium, potassium urea, creatinine, glucose, albumin, hepatic enzymes, international normalized ratio [INR], troponins)
5. Measurement of natriuretic peptides
6. Echocardiography
7. Instrumentation and monitoring (arterial line, central venous line, pulmonary artery catheter, coronary angiography)

Management/Treatment

1. Organization of treatment
2. Oxygen
3. Non-invasive ventilation
4. Morphine and analogues
5. Loop diuretics
6. Vasodilators
7. Inotropic agents (e.g., dopamine, dobutamine, phosphodiesterase inhibitors)
8. Vasopressor therapy (norepinephrine)
9. Cardiac glycosides
10. Early reperfusion in patients with acute coronary syndrome
11. Management of patients with acutely decompensated chronic heart failure treated with beta-blockers and ACEIs/ARBs

Implementation and Delivery of Care

1. Heart failure management programs
2. Palliative care

MAJOR OUTCOMES CONSIDERED

- Sensitivity, accuracy, utility of diagnostic tests for heart failure
- Overall mortality
- In-hospital mortality
- Re-hospitalization
- Survival
- Symptom improvement
- Quality of life

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

Not stated

NUMBER OF SOURCE DOCUMENTS

Not stated

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Weighting According to a Rating Scheme (Scheme Given)

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Levels of Evidence

Level of Evidence A	Data derived from multiple randomized clinical trials or meta-analyses
Level of Evidence B	Data derived from a single randomized clinical trial or large non-randomized studies
Level of Evidence C	Consensus of opinion of the experts and/or small studies, retrospective studies, registries

METHODS USED TO ANALYZE THE EVIDENCE

Review of Published Meta-Analyses
Systematic Review

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Not stated

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

This report was drafted by a Writing Group of the Task Force appointed by the Clinical Practice Group of the European Society of Cardiology. These guidelines are a development and revision of guidelines published in 1995, 1997, 2001, and 2005. Much new information relating to the treatment of heart failure (HF) has emerged. This has necessitated a revision of some previous recommendations. The recommendations are relevant to clinical practice, epidemiological surveys, observational studies, and clinical trials. Particular attention in this revision has been given to the simplification and clarity of recommendations, and to the problems associated with implementation. The intention has been to merge and modify previous documents relating to HF.

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Classes of Recommendations

Classes of Recommendations	Definition
Class I	Evidence and/or general agreement that a given treatment or procedure is beneficial, useful, effective
Class II	Conflicting evidence and/or a divergence of opinion about the usefulness/efficacy of the given treatment or procedure
Class IIa	Weight of evidence/opinion is in favour of usefulness/efficacy.

Classes of Recommendations	Definition
Class IIb	Usefulness/efficacy is less well established by evidence/opinion
Class III	Evidence or general agreement that the given treatment or procedure is not useful/effective, and in some cases may be harmful.

COST ANALYSIS

A formal cost analysis was not performed and published cost analyses were not reviewed.

METHOD OF GUIDELINE VALIDATION

Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

A draft of the guidelines was sent to the Committee for Practice Guidelines (CPG) and the document reviewers. After consideration of their input, the document was updated, reviewed, and then approved for publication by the entire Task Force.

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

The class of recommendations (I-III) and levels of evidence (A-C) are defined at the end of the "Major Recommendations" field.

Diagnosis of Heart Failure

Symptoms and Signs of Heart Failure

Symptoms and signs of heart failure (HF) are the key to early detection because that is what cause patients to seek medical attention. Taking a good history and careful physical examination are skills, which are essential to master (see Table 8 in the original guideline document). Breathlessness, tiredness, and fatigue are the characteristic symptoms, but eliciting and assessing these symptoms particularly in the elderly requires experience and skill. The clinical signs of HF (see Table 9 in the original guideline document) should be assessed in a careful clinical examination, including observation, palpation, and auscultation. Likewise for symptoms, the signs of early HF can be difficult to interpret, not only in elderly patients, but also in the obese. The clinical suspicion of HF must then be confirmed by more objective tests particularly targeting assessment of cardiac function.

Algorithm for the Diagnosis of Heart Failure

An algorithm for the diagnosis of HF or left ventricular (LV) dysfunction is shown in Figure 1 of the original guideline document. The diagnosis of HF is not sufficient alone. Appropriate investigations are required to establish the cause of the HF, because although the general treatment of HF is common to most patients, some causes require specific treatments and may be correctable.

Diagnostic Techniques

Diagnostic Tests in Heart Failure

Several diagnostic tests are employed routinely to confirm or rule out the diagnosis of HF (see Table 11 in the original guideline document). Diagnostic tests are usually most sensitive for the detection of patients with HF and reduced ejection fraction (EF). Diagnostic findings are often less pronounced in patients with HF with preserved ejection fraction (HFPEF). Echocardiography is the most useful method for evaluating systolic and diastolic dysfunction.

The following investigations are considered appropriate in patients with HF. However, the recommendations largely represent expert consensus opinion without adequate documented evidence. **Level of evidence C** applies unless otherwise stated.

Electrocardiogram

An electrocardiogram (ECG) should be performed in every patient with suspected heart failure.

Chest X-ray

Chest x-ray is an essential component of the diagnostic work-up in heart failure. It permits assessment of pulmonary congestion and may demonstrate important pulmonary or thoracic causes of dyspnoea.

Laboratory Tests

A routine diagnostic evaluation of patients with suspected HF includes a complete blood count (haemoglobin, leukocytes, and platelets), serum electrolytes, serum creatinine, estimated glomerular filtration rate (GFR), glucose, liver function tests, urinalysis. Additional tests should be considered according to the clinical picture (see Table 14 in the original guideline document).

Natriuretic Peptides

Plasma concentrations of natriuretic peptides are useful biomarkers in the diagnosis of HF and in the management of patients with established chronic HF. Evidence exists supporting their use for diagnosing, staging, making hospitalization/discharge decisions, and identifying patients at risk for clinical events. The evidence for their use in monitoring and adjusting drug therapy is less clearly established.

Troponins

Troponin I or T should be sampled in suspected HF when the clinical picture suggests an acute coronary syndrome (ACS). An increase in cardiac troponins indicates myocyte necrosis and, if indicated, the potential for revascularization should be considered and an appropriate diagnostic work-up performed.

Neurohormonal Markers

HF is accompanied by an increase in various other neurohormonal markers (norepinephrine, renin, aldosterone, endothelin, arginine vasopressin). Although useful in research, evaluation of neuroendocrine activation is not required for diagnostic prognostic purposes in individual patients.

Echocardiography

The term echocardiography is used to refer to all cardiac ultrasound imaging techniques, including pulsed and continuous wave Doppler, colour Doppler and tissue Doppler imaging (TDI).

Confirmation by echocardiography of the diagnosis of HF and/or cardiac dysfunction is mandatory and should be performed shortly following suspicion of the diagnosis of HF.

The most practical measurement of ventricular function for distinguishing between patients with systolic dysfunction and patients with preserved systolic function is the left ventricular ejection fraction (LVEF) (normal >45-50%). This cut-off is somewhat arbitrary. LVEF is not synonymous with indices of contractility as it is strongly dependent on volumes, preload, afterload, heart rate, and valvular function. Stroke volume may be maintained by cardiac dilatation and increased volumes. Tables 15 and 16 in the original guideline document present the most common echocardiographic and Doppler abnormalities in HF.

Assessment of Left Ventricular Diastolic Function

Assessment of diastolic function using evaluation of the ventricular filling pattern is important for detecting abnormalities of diastolic function or filling in patients with HF.

Assessment of Heart Failure with Preserved Ejection Fraction (HFPEF)

Echocardiography plays a major role in confirming the diagnosis of HFPEF. The diagnosis of HFPEF requires three conditions to be satisfied:

1. Presence of signs and/or symptoms of chronic HF
2. Presence of normal or only mildly abnormal LV systolic function (LVEF ≥45-50%)
3. Evidence of diastolic dysfunction (abnormal LV relaxation or diastolic stiffness)

Transoesophageal Echocardiography

Transoesophageal echocardiography (TOE) is recommended in patients who have an inadequate transthoracic echo window (obesity, ventilated patients), in complicated valvular patients (especially aortic, mitral, and mechanical valves), in suspected endocarditis, in congenital heavy disease, or to exclude a thrombus in the left atrial appendage in patients with atrial fibrillation (AF).

Stress Echocardiography

Stress echocardiography (dobutamine or exercise echo) is used to detect ventricular dysfunction caused by ischaemia and to assess myocardial viability in the presence of marked hypokinesis or akinesis. It may also be useful in identifying myocardial stunning, hibernation, and in relating HF symptoms to valvular abnormalities. In patients with HF, stress echo may have a lower sensitivity and specificity due to LV dilation or the presence of bundle branch block.

Additional Non-invasive Imaging Tests

In patients in whom echocardiography at rest has not provided adequate information and in patients with suspected coronary artery disease (CAD), further non-invasive imaging may include cardiac magnetic resonance imaging (CMR), cardiac computed tomography (CT), or radionuclide imaging.

Pulmonary Function Tests

Measurements of pulmonary function are of limited value in the diagnosis of HF. However, these tests are useful in demonstrating or excluding respiratory causes of breathlessness and assessing the potential contribution of lung disease to the patient's dyspnoea.

Exercise Testing

Exercise testing is useful for the objective evaluation of exercise capacity and exertional symptoms, such as dyspnoea and fatigue. The 6-min walk test is a simple, reproducible, readily available tool frequently employed to assess submaximal functional capacity and evaluate the response to intervention.

Ambulatory ECG Monitoring (Holter)

Ambulatory ECG monitoring is valuable in the assessment of patients with symptoms suggestive of an arrhythmia (e.g., palpitations or syncope) and in monitoring ventricular rate control in patients with AF. It may detect and quantify the nature, frequency, and duration of atrial and ventricular arrhythmias and silent episodes of ischaemia which could be causing or exacerbating symptoms of HF.

Cardiac Catheterization

Cardiac catheterization is unnecessary for the routine diagnosis and management of patients with HF. Invasive investigation is frequently indicated to elucidate

aetiology, to obtain important prognostic information, and if revascularization is being considered.

Coronary Angiography

Coronary angiography should be considered in HF patients with a history of exertional angina or suspected ischaemic LV dysfunction, following cardiac arrest, and in those with a strong risk factor profile for coronary heart disease, and may be urgently required in selected patients with severe HF (shock or acute pulmonary oedema) and in patients not responding adequately to treatment. Coronary angiography and LV ventriculography are also indicated in patients with refractory HF of unknown aetiology and in patients with evidence of severe mitral regurgitation or aortic valve disease potentially correctable by surgery.

Right Heart Catheterization

Right heart catheterization provides valuable haemodynamic information regarding filling pressures, vascular resistance and cardiac output. Its role in the diagnosis of HF is, in clinical practice, limited.

Endomyocardial Biopsy

Specific myocardial disorders may be diagnosed by endomyocardial biopsy (EMB). Clinical decisions must be made from available case-controlled studies and expert opinion statements.

Prognosis

Determining prognosis in HF is complex. Diverse aetiologies, age, frequent co-morbidities, variation in individual progression and outcomes (sudden vs. progressive HF death) must be considered. The impact on prognosis of specific treatments in individual patients with HF is often difficult to predict. The variables most consistently as independent outcome predictors are reported in Table 17 of the original guideline document.

Non-Pharmacological Management

Self-Care Management

- Self-care management is a part of successful HF treatment and can significantly impact on symptoms, functional capacity, well-being, morbidity, and prognosis. Self-care can be defined as actions aimed at maintaining physical stability, avoidance of behavior that can worsen the condition and detection of the early symptoms of deterioration.
- Important self-care behaviors in heart failure are presented in Table 18 of the original guideline document.
- It is recommended that healthcare professionals provide comprehensive heart failure education counseling.

The webpage heartfailurematters.org represents an internet tool provided by the Heart Failure Association of the ESC that permits

patients, their next of kin, and care givers to obtain useful, practical information in a user-friendly format.

The following management options are considered appropriate in patients with symptomatic HF. The recommendations largely represent expert consensus opinion without adequate documented evidence.

Adherence to Treatment

- A strong relationship between healthcare professionals and patients as well as sufficient social support from an active social network has been shown to improve adherence to treatment. It is recommended that family members be invited to participate in education programmes and decisions regarding treatment and care.
- Patients should have adequate knowledge of their medical treatment, especially regarding effects, side effects, and how the medication should be taken and titrated. This may be challenging in patients with cognitive dysfunction.
- Patients should be aware that the beneficial effects of therapy may be delayed and not have unrealistic expectations regarding the initial response to treatment. It must be explained that side effects are often transient and it might take months to uptitrate and assess the full effects of a drug.
- Interventions to improve adherence are recommended and should be targeted by the healthcare provider.

Class of recommendation I, level of evidence C

Symptom Recognition

Patients and/or caregivers should learn to recognize the symptoms of deterioration and take appropriate action such as increasing the prescribed diuretic dose and/or contact the healthcare team.

- Flexible dosage of diuretics based on symptoms and fluid balance should be recommended, within pre-specified limits, after detailed instructions and education.

Class of recommendation I, level of evidence C

Weight Monitoring

- Patients should weigh themselves on a regular basis to monitor weight change, preferably as part of a regular daily routine. In the case of a sudden unexpected weight gain of >2 kg in 3 days, patients may increase their diuretic dose and should alert the healthcare team. The risks of volume depletion with excessive diuretic use must be explained.

Class of recommendation I, level of evidence C

Diet and Nutrition

Sodium Intake

Sodium restriction is recommended in symptomatic HF to prevent fluid retention. Although no specific guidelines exist, excessive intake of salt should be avoided. Patients should be educated concerning the salt content of common foods.

Class of recommendation IIa, level of evidence C

Fluid Intake

Fluid restriction of 1.5-2 L/day may be considered in patients with severe symptoms of HF especially with hyponatraemia. Routine fluid restriction in all patients with mild to moderate symptoms does not appear to confer clinical benefit.

Class of recommendation IIb, level of evidence C

Alcohol

- Alcohol intake should be limited to 10-20 g/day (1 to 2 glasses of wine/day)

Class of recommendation IIa, level of evidence C

- Patients suspected of having alcohol-induced cardiomyopathy should abstain from alcohol completely.

Class of recommendation I, level of evidence C

Weight Reduction

- Weight reduction in obese [body mass index (BMI) >30 kg/m^2] persons with HF should be considered in order to prevent the progression of HF, decrease symptoms, and improve well-being.

Class of recommendation IIa, level of evidence C

- In moderate to severe HF, weight reduction should not routinely be recommended since unintentional weight loss and anorexia are common problems.

Unintentional Weight Loss

- If weight loss during the last 6 months is >6% of previous stable weight without evidence of fluid retention, the patient is defined as cachectic. The patient's nutritional status should be carefully assessed.

Class of recommendation I, level of evidence C

Smoking

- It is recommended that patients receive support and advice and be motivated to stop smoking.

Class of recommendation I, level of evidence C

Immunization

- Pneumococcal vaccination and annual influenza vaccination should be considered in patients with symptomatic HF without known contraindications.

Class of recommendation IIa, level of evidence C

Activity and Exercise Training

- Regular, moderate daily activity is recommended for all patients with heart failure.

Class of recommendation I, level of evidence B

- Exercise training is recommended, if available, to all stable chronic HF patients. There is no evidence that exercise training should be limited to any particular HF patient subgroups (aetiology, New York Heart Association [NYHA] class, LVEF, or medication). Exercise training programmes appear to have similar effects whether provided in a hospital or at home.

Class of recommendation I, level of evidence A

Sexual Activity

Patients may be advised to use sublingual nitroglycerine as prophylaxis against dyspnoea and chest pain during sexual activity.

- Phosphodiesterase 5 (PDES) inhibitors (e.g. sildenafil) reduce pulmonary pressures but are not currently recommended for patients with advanced HF. They should never be used in combinations with nitrate preparations.

Class of recommendation III, level of evidence B

- Individualized sensitive counseling is recommended for both male and female patients and their partners.

Class of recommendation I, level of evidence C

Pregnancy and Contraception

- Pregnancy may lead to deterioration of HF due to the rise in blood volume and increase in cardiac output, as well as the substantial increase in extravascular fluid. Importantly, many medications used in HF treatment are contraindicated during pregnancy.

- The risk of pregnancy is considered greater than the risks linked to contraceptive use. It is recommended that women with heart failure discuss contraceptives and planned pregnancy with a physician in order to make an informed decision based on assessment of potential risks.

Travelling

High altitudes (>1500 m) and travel to very hot and humid destinations should be discouraged for symptomatic patients. Planned travel should be discussed with the HF team. As a rule, air travel is preferable to long journeys by other means of transportation.

Sleep Disorders

- Weight loss in severely overweight persons, smoking cessation, and abstinence of alcohol can reduce risk and is recommended.

Class of recommendation I, level of evidence C

- Treatment with a continuous positive airway pressure (CPAP) should be considered in obstructive sleep apnoea documented by polysomnography.

Class of recommendation IIa, level of evidence C

Depression and Mood Disorders

- There is limited evidence regarding screening and assessment tools as well as of the efficacy of psychological and pharmacological interventions in patients with HF. However, screening for depression and initiation appropriate treatment should be considered in patients with suggestive symptoms.

Class of recommendation IIa, level of evidence C

Prognosis

Although challenging to discuss, it is important that patients understand the important prognostic factors. Recognition of the impact of treatment on prognosis may motivate patients to adhere to treatment recommendations. An open discussion with the family may assist in making realistic and informed decisions regarding treatment and future plans.

Pharmacological Therapy

Angiotensin-Converting Enzyme Inhibitors (ACEIs)

Unless contraindicated or not tolerated, an ACEI should be used in all patients with symptomatic HF and a LVEF ≤40%. Treatment with an ACEI improves ventricular function and patient well-being, reduces hospital admission for worsening HF, and increases survival. In hospitalized patients, treatment with an ACEI should be initiated before discharge.

Class of recommendation I, level of evidence A

Which Patients Should Get an ACEI?

Indications, based upon the patients enrolled in the randomized controlled trials (RCTs): LVEF ≤40%, irrespective of symptoms.

Contraindications

- History of angioedema
- Bilateral renal artery stenosis
- Serum potassium concentration >5.0 mmol/L
- Serum creatinine >220 micromol/L (~2.5 mg/dL)
- Severe aortic stenosis

Refer to the original guideline document for dosing information.

Beta-Blockers

Unless contraindicated or not tolerated, a beta-blocker should be used in all patients with symptomatic HF and an LVEF ≤40%. Beta-blockade improves ventricular function and patient well-being, reduces hospital admission for worsening HF, and increases survival. Where possible, in hospitalized patients, treatment with a beta-blocker should be initiated cautiously before discharge.

Class of recommendation I, level of evidence A

Which Patients Should Get a Beta-Blocker?

Indications, based upon patients enrolled in the RCTs:

- LVEF ≤40%
- Mild to severe symptoms (NYHA functional class II-IV); patients with asymptomatic LV systolic dysfunction after myocardial infarction (MI) also have an indication for a beta-blocker
- Optimal dose level of an ACEI or/and angiotensin receptor blocker (ARB) (and aldosterone antagonist, if indicated)
- Patients should be clinically stable (e.g., no recent change in dose of diuretic). Cautious, pre-discharge, initiation is possible in a recently decompensated patient provided that patient has improved with other treatments, is not dependent on an i.v. inotropic agent, and can be observed in hospital for at least 24 hours after initiation of beta-blocker treatment.

Contraindications

- Asthma (chronic obstructive pulmonary disease [COPD] is not a contraindication)
- Second- or third-degree heart block, sick sinus syndrome (in the absence of a permanent pacemaker), sinus bradycardia (<50 beats per minute [b.p.m.])

Refer to the original guideline document for dosing information.

Aldosterone Antagonists

Unless contraindicated or not tolerated, the addition of a low-dose of an aldosterone antagonist should be considered in all patients with an LVEF $\leq$35% and severe symptomatic HF, (i.e., currently NYHA functional class III or IV, in the absence of hyperkalaemia and significant renal dysfunction). Aldosterone antagonists reduce hospital admission for worsening HF and increase survival when added to existing therapy, including an ACEI. In hospitalized patients satisfying these criteria, treatment with an aldosterone antagonist should be initiated before discharge.

Class of recommendation I, level of evidence B

Patients Who Should Get an Aldosterone Antagonist

Indications based upon the RCT:

- LVEF $\leq$35%
- Moderate to severe symptoms (NYHA functional class III-IV)
- Optimal dose of a beta-blocker and an ACEI or an ARB (but not an ACEI and an ARB)

Contraindications

- Serum potassium concentration >5.0 mmol/L
- Serum creatinine > 220 micromol/L (~2.5 mg/dL)
- Concomitant potassium sparing diuretic or potassium supplements
- Combination of an ACEI and ARB

Refer to the original guideline document for dosing information.

Angiotensin Receptor Blockers (ARBs)

Unless contraindicated or not tolerated, and ARB is recommended in patients with HF and LVEF $\leq$40% who remain symptomatic despite optimal treatment with an ACEI and beta-blocker, unless also taking an aldosterone antagonist. Treatment with an ARB improves ventricular function and patient well-being, and reduces hospital admission for worsening HF.

Class of recommendation I, level of evidence A

Treatment reduces the risk of death from cardiovascular causes.

Class of recommendation IIa, level of evidence B

- An ARB is recommended as an alternative in patients intolerant of an ACEI. In these patients, an ARB reduces the risk of death from a cardiovascular cause or hospital admission for worsening HF. In hospitalized patients, treatment with an ARB should be initiated before discharge.

Class of recommendation I, level of evidence B

Patients Who Should Get an Angiotensin Receptor Blocker

Indications, based upon the patients enrolled in the RCTs:

- LVEF ≤40% and either
    - As an alternative in patients with mild to severe symptoms (NYHA functional class II-IV) who are intolerant of ACEI
    - Or in patients with persistent symptoms (NYHA functional class II-IV) despite treatment with an ACEI and beta-blocker
- ARBs may cause worsening of renal function, hyperkalaemia, and symptomatic hypotension with an incidence similar to an ACEI. They do not cause cough.

Contraindications

- As with ACEIs, with the exception of antioedema
- Patients treated with an ACEI *and* an aldosterone antagonist
- An ARB should only be used in patients with adequate renal function and normal serum potassium concentration; serial monitoring of serum electrolytes and renal function is mandatory, especially if an ARB is used in conjunction with an ACEI.

Refer to the original guideline document for dosing information.

Hydralazine and Isosorbide Dinitrate (H-ISDN)

In symptomatic patients with an LVEF ≤40%, the combination of H-ISDN may be used as an *alternative* if there is intolerance to both an ACEI and an ARB. *Adding* the combination of H-ISDN should be considered in patients with persistent symptoms despite treatment with an ACEI, beta-blocker, and an ARB or aldosterone antagonist. Treatment with H-ISDN in these patients may reduce the risk of death.

Class of recommendation IIa, level of evidence B

Reduces hospital admission for worsening HF.

Class of recommendation IIa, level of evidence B

Improves ventricular function and exercise capacity.

Class of recommendation IIa, level of evidence A

Patients Who Should Get Hydralazine and Isosorbide Dinitrate

Indications, based upon the patients enrolled in the RCTs

- An alternative to an ACEI/ARB when both of the latter are not tolerated
- As add-on therapy to an ACEI if an ARB or aldosterone antagonist is not tolerated
- Evidence is strongest in patients of Africa-American descent

Contraindications

- Symptomatic hypotension
- Lupus syndrome
- Severe renal failure (dose reduction may be needed)

Refer to the original guideline document for dosing information.

Digoxin

In patients with symptomatic HF and AF, digoxin may be used to slow a rapid ventricular rate. In patients with AF and an LVEF ≤40% it should be used to control heart rate in addition to, or prior to a beta-blocker.

Class of recommendation I, level of evidence C

In patients in sinus rhythm with symptomatic HF and an LVEF ≤40%, treatment with digoxin (in addition to an ACEI) improves ventricular function and patient well-being, reduces hospital admission for worsening HF, but has no effect on survival.

Class of recommendation IIa, level of evidence B

Patients with Heart Failure Who Should Get Digoxin

Indications, based upon patients enrolled in the RCTs:

Atrial fibrillation

- With ventricular rate at rest >80 b.p.m., at exercise > 110-120 b.p.m.

Sinus Rhythm

- LV systolic dysfunction (LVEF ≤40%)
- Mild to severe symptoms (NYHA functional class II-IV)
- Optimal dose of ACEI or/and an ARB, beta-blocker and aldosterone antagonist, if indicated

Contraindications

- Second- or third-degree heart block (without a permanent pacemaker); caution if suspected sick sinus syndrome
- Pre-excitation syndromes
- Previous evidence of digoxin intolerance

Diuretics

Diuretics are recommended in patients with HF and clinical signs or symptoms of congestion.

Class of recommendation I, level of evidence B

Key Points

- Diuretics provide relief from the symptoms and signs of pulmonary and systemic venous congestion in patients with HF.
- Diuretics cause activation of the renin-angiotensin-aldosterone system in patients with mild symptoms of HF and should usually be used in combination with an ACEI/ARB.
- The dose requirement must be tailored to the individual patient's need and requires careful clinical monitoring.
- In general, a loop diuretic will be required in moderate or severe HF.
- A thiazide may be used in combination with loop diuretics for resistant oedema, but with caution to avoid dehydration, hypovolaemia, hyponatraemia, or hypokalaemia.
- It is essential to monitor potassium, sodium, and creatinine levels during diuretic therapy.

Diuretic and ACEIs/ARBs/Aldosterone Antagonists

- Volume depletion and hyponatraemia from excessive diuresis may increase the risk of hypotension and renal dysfunction with ACEI/ARB therapy.
- If an ACEIs/ARBs/aldosterone antagonist is used with a diuretic, potassium replacement will usually not be required.
- Serious hyperkalaemia can occur if potassium-sparing diuretics, including aldosterone antagonists, are used in combination with ACEIs/ARBs. Non-aldosterone antagonist potassium-sparing diuretics should be avoided. The combination of an aldosterone antagonist and ACEI/ARB should only be used under careful supervision.

How to Use Diuretics in Heart Failure

<u>Initiation of Diuretic Therapy</u>

- Check renal function and serum electrolytes
- Most patients are prescribed loop diuretics rather than thiazides due to the higher efficiency of induced dieresis and natriuresis

Refer to Table 21 in the original guideline document for practical considerations in treatment of HF with loop diuretics.

Refer to the original guideline document for dosing information.

Other Drugs Used to Treat Cardiovascular Comorbidity in Patients with Heart Failure

Anticoagulants (Vitamin K Antagonists)

Warfarin (or an alternative oral anticoagulant) is recommended in patients with HF and permanent, persistent, or paroxysmal AF without contraindications to

anticoagulation. Adjusted-dose anticoagulation reduces the risk of thromboembolic complications including stroke.

Class of recommendation I, level of evidence A

Anticoagulation is also recommended in patients with intracardiac thrombus detected by imaging or evidence of systemic embolism.

Class of recommendation I, level of evidence C

Hydroxy-3-Methylglutaryl Coenzyme A (HMG CoA) Reductase Inhibitors ('Statins')

In elderly patients with symptomatic chronic HF patients with systolic dysfunction caused by CAD, statin treatment may be considered to reduce cardiovascular hospitalization.

Class of recommendation IIb, level of evidence B

Management of Patients with Heart Failure and Preserved Left Ventricular Ejection Fraction (HFPEF)

- No treatment has yet been shown, convincingly, to reduce morbidity and mortality in patients with HFPEF. Diuretics are used to control sodium and water retention and relieve breathlessness and oedema. Adequate treatment of hypertension and myocardial ischaemia is also considered to be important as is control of the ventricular rate is patients with AF.

Devices and Surgery

Revascularization Procedures, Valvular and Ventricular Surgery

- If clinical symptoms of HF are present, surgically correctable conditions should be detected and corrected if indicated.

Revascularization in Patients with Heart Failure

Both a coronary artery bypass grafting (CABG) and percutaneous coronary intervention (PCI) should be considered in selected HF patients with CAD. Decisions regarding the choice of the method revascularization should be based on a careful evaluation of co-morbidities, procedural risk, coronary anatomy and evidence of the extent of viable myocardium in the area to be revascularized, LV function, and the presence of haemodynamically significant valvular disease.

Evaluation for Coronary Artery Disease in Heart Failure Patients with Unknown Coronary Artery Status

Routine coronary angiography is not recommended.

In patients at low risk for CAD: the results of non-invasive evaluation should determine the indication for subsequent angiography (exercise ECG, stress echocardiography, stress nuclear perfusion imaging).

Coronary Angiography

- Is recommended in patients at high risk for CAD without contraindications to establish diagnosis and plan treatment strategy.

Class of recommendation I, level of evidence C

- Is recommended in patients with HF and evidence of significant vascular disease.

Class of recommendation I, level of evidence C

- Should be considered in patients with HF who experience anginal symptoms despite optimal medical therapy.

Class of recommendation IIa, level of evidence C

Detection of Viable Myocardium

As viable myocardium may be a target for revascularization, its detection should be considered in the diagnostic work-up in HF patients with CAD. Several imaging modalities with comparable diagnostic accuracy may be employed to detect dysfunctional but viable myocardium (dobutamine echocardiography, nuclear imaging by single-photon emission computed tomography [SPECT] and/or by positron emission tomography [PET], magnetic resonance imaging [MRI] with dobutamine and/or with contrast agents, CT with contrast agents).

Class of recommendation IIa, level of evidence C

Valvular Surgery

- Valvular heart disease (VHD) may be the underlying aetiology for HF or an important aggravating factor that requires specific management.
- The ESC Guidelines on the management of valvular disease apply to most patients with HF. Although impaired LVEF is an important risk factor for higher peri- and postoperative mortality, surgery may be considered in symptomatic patients with poor LV function.
- Optimal medical management of both HF and cc-morbid conditions prior to surgery is imperative. Emergency surgery should be avoided if possible.
- Specific recommendations concerning surgery for patients with VHD and HF are difficult to provide. Decisions should be based on a thorough clinical and echocardiographic assessment with attention to cardiovascular and non-cardiovascular co-morbidities. Decisions concerning surgery for haemodynamically important aortic stenosis, aortic regurgitation, or mitral regurgitation require careful consideration of the patient's motivation, biological age and risk profile.

Aortic Valve Surgery

Aortic Stenosis (AS)

Medical treatment should be optimized but not delay the decision regarding valve surgery. Vasodilators (ACEIS, ARBS, and nitrates) may cause substantial hypotension in patients with severe AS and should be used only with great caution.

Surgery

- Is recommended in eligible patients with HF symptoms and severe AS.

Class of recommendation I, level of evidence C

- Is recommended in asymptomatic patients with severe AS and impaired LVEF (<50%).

Class of recommendation I, level of evidence C

- May be considered in patients with a severely reduced valve area and LV dysfunction.

Class of recommendation IIb, level of evidence C

Aortic Regurgitation (AR)

Surgery

- Is recommended in all eligible patients with severe AR who have symptoms of HF.

Class of recommendation I, level of evidence B

- Is recommended in asymptomatic patients with severe AR and moderately impaired LVEF (LVEF $\leq$50%).

Class of recommendation IIa, level of evidence C

Mitral Valve Surgery

Mitral Regurgitation (MR)

Surgery

- In patients with HF and severe mitral valve regurgitation, symptomatic improvement has been reported in selected patients. Surgery should be considered in patients with severe MR whenever coronary revascularization is an option. Surgical repair of the valve may represent an attractive option in carefully selected patients.

Organic Mitral Regurgitation

- In patients with severe organic MR due to a structural abnormality or damage to the mitral valve, development of HF symptoms is a strong indication for surgery.

Surgery

- Is recommended for patients with LVEF >30% (valve repair if possible).

Class of recommendation I, level of evidence C

- May be considered for patients with severe MR and LVEF <30%; medical therapy should be a first choice. Only if patients remain refractory to pharmacological treatment and have a low risk profile should surgery be considered.

Class of recommendation IIb, level of evidence C

Functional Mitral Regurgitation

Surgery

- May be considered in selected patients with severe functional MR and severely depressed LV function, who remain symptomatic despite optimal medical therapy.

Class of recommendation IIb, level of evidence C

- Cardiac resynchronization therapy (CRT) should be considered in eligible patients as it may improve LV geometry, papillary muscle dyssynchrony and may reduce MR.

Class of recommendation IIa, level of evidence B

Ischaemic Mitral Regurgitation

Surgery

- Is recommended in patients with severe MR and LVEF >30% when coronary artery bypass grafting (CABG) is planned.

Class of recommendation I, level of evidence C

- Should be considered in patients with moderate MR undergoing CABG if repair if feasible.

Class of recommendation IIa, level of evidence C

Tricuspid Regurgitation (TR)

- Functional TR is extremely common in HF patients with biventricular dilatation, systolic dysfunction, and pulmonary hypertension. Symptoms of right-sided HF with systemic congestion respond poorly to aggressive diuretic therapy, which may aggravate symptoms such as fatigue and exercise intolerance. Surgery for isolated functional TR is not indicated.

Class of recommendation III, level of evidence C

Left Ventricular Aneurysmectomy

- LV aneurysmectomy may be considered in symptomatic patients with large discrete LV aneurysms.

Class of recommendation IIb, level of evidence C

Cardiomyopathy

- Cardiomyopathy and partial left ventriculectomy (Batista operation) is not recommended for the treatment of HF or as an alternative to heart transplantation.

Class of recommendation III, level of evidence C

External Ventricular Restoration

- External ventricular restoration is not recommended for the treatment of HF.

Class of recommendation III, level of evidence C

Pacemakers

- The conventional indications for patients with normal LV function also apply to patients with HF. In patients with HF and sinus rhythm, maintenance of a normal chronotropic response and coordination of atrial and ventricular contraction with a dual chamber pacing (DDD) pacemaker may be especially important.
- In HF patients with concomitant indication for permanent pacing (first implant or upgrading of a conventional pacemaker) and NYHA class II-IV symptoms, low LVEF $\leq$35%, or LV dilatation, CRT with pacemaker function (CRT-P) should be considered. In these patients, the use of right ventricular pacing may be deleterious and may cause or increase dyssynchrony.

Class of recommendation IIa, level of evidence C

Cardiac Resynchronization Therapy (CRT)

- CRT with pacemaker (CRT-P) is recommended to reduce morbidity and mortality in patients in NYHA III-IV class who are symptomatic despite optimal medial therapy, and who have a reduced EF (LVEF $\leq$35%) and QRS prolongation (QRS width $\geq$120 milliseconds [ms]).

Class of recommendation I, level of evidence A

- CRT with defibrillator function (CRT-D) is recommended to reduce morbidity and mortality in patients in NYHA III-IV class who are symptomatic despite optimal medical therapy, and who have a reduced EF (LVEF $\leq$35%) and QRS prolongation (QRS width $\geq$120 ms).

Class of recommendation I, level of evidence A

- The survival advantage of CRT-D vs. CRT-P has not been adequately addressed. Due to the documented effectiveness of ICD therapy in the prevention of sudden cardiac death, the use of a CRT-D device is commonly preferred in clinical practice in patients satisfying CRT criteria including an expectation of survival with good functional status for >1 year.

Table. Class I Recommendations for Devices in Patients with LV Systolic Dysfunction

ICD		
Prior resuscitated cardiac arrest	**Class I**	**Level A**
Ischaemic aetiology and >40 days of MI	**Class I**	**Level A**
Non-ischaemic aetiology	**Class I**	**Level B**
CRT		
NYHA Class III/IV and QRS >120 ms	**Class I**	**Level A**
To improve symptoms/reduce hospitalization	**Class I**	**Level A**
To reduce mortality	**Class I**	**Level A**

Implantable Cardioverter Defibrillator (ICD)

- ICD therapy for *secondary prevention* is recommended for survivors of ventricular fibrillation (VF) and also for patients with documented of haemodynamically unstable VT and/or VT with syncope, a LVEF $\leq$40%, on optimal medical therapy, and with an expectation of survival with good functional status for >1 year.

Class of recommendation I, level of evidence A

- ICD therapy for *primary prevention* is recommended to reduce mortality in patients with LV dysfunction due to prior MI who are at least 40 days post-MI, have an LVEF $\leq$35%, in NYHA functional class II or III, receiving optimal medical therapy, and who have a reasonable expectation of survival with good functional status for >1 year.

Class of recommendation I, level of evidence A

- ICD therapy for primary prevention is recommended to reduce mortality in patients with non-ischaemic cardiomyopathy with an LVEF $\leq$35%, in NYHA

functional class II or III, receiving optimal medical therapy, and who have a reasonable expectation of survival with good functional status for >1 year.

Class of recommendation I, level of evidence B

Heart Transplantation, Ventricular Assist Devices, and Artificial Hearts

Heart Transplantation

Heart transplantation is an accepted treatment for end-stage HF. Although controlled trials have never been conducted, there is consensus that transplantation, provided proper selection criteria are applied, significantly increases survival, exercise capacity, return to work and quality of life compared with conventional treatment.

Class of recommendation I, level of evidence C

Key Points

Patients with severe HF symptoms, a poor prognosis, and with no alternative form of treatment should be considered for heart transplantation. The introduction of new techniques and more sophisticated pharmacological treatment has modified the prognostic significance of the variables traditionally used to identify heart transplant candidates (peak oxygen consumption [VO_2]). The patient must be well informed, motivated, emotionally stable, and capable of complying with intensive medical treatment.

Apart from the shortage of donor hearts, the main challenge of heart transplantation is prevention of rejection of the allograft, which is responsible for a considerable percentage of deaths in the first post-operative year. The tong-term outcome is limited predominantly by the consequences of tong-term immunosuppressive therapy (infection, hypertension, renal failure, malignancy, and CAD). Heart transplantation should be considered in motivated patients with end-stage HF, severe symptoms, no serious co-morbidity, and no alternative treatment options. The contraindications include: current alcohol and/or drug abuse, lack of proper cooperation, serious mental disease not property controlled, treated cancer with remission and <5 years follow-up, systemic disease with multiorgan involvement, active infection, significant renal failure (creatinine clearance <50 mL/min), irreversible high pulmonary vascular resistance (6-8 Wood units and mean trans-pulmonary gradient >15 mmHg), recent thromboembolic complications, unhealed peptic ulcer, evidence of significant liver impairment, or other serious co-morbidity with a poor prognosis.

Left Ventricular Assist Devices (LVAD) and Artificial Heart

There has been rapid progress in the development of LVAD technology and artificial hearts. Due to the nature of the target population, there is limited documentation from randomized clinical trials. The current recommendations reject this limited evidence. There is therefore no consensus concerning LVAD indications or the most appropriate patient population. LVAD technology is likely

to undergo substantial improvement in the near future, and the recommendations will need revision accordingly.

- Current indications for LVADS and artificial hearts include bridging to transplantation and managing patients with acute, severe myocarditis.

Class of recommendation IIa, level of evidence C

- Although experience is limited, these devices may be considered for long-term use when no definitive procedure is planned.

Class of recommendation IIb, level of evidence C

Ultrafiltration

Ultrafiltration should be considered to reduce fluid overload (pulmonary and/or peripheral oedema) in selected patients and correct hyponatraemia in symptomatic patients refractory to diuretics.

Class of recommendation IIa, level of evidence B

Remote Monitoring

Remote monitoring can be summarized as the continuous collection of patient information and the capability to review this information without the patient present. The collection of this information may require patient participation for measures such as weight, BP, ECG, or symptoms. Newer implanted devices provide access to information such as heart rate, arrhythmia episodes, activity, intracardiac pressure, or thoracic impedance without the need to actively involve the patient.

Continuous analysis of these trends can activate notification mechanisms when clinically relevant changes are detected, and therefore facilitate patient management. Although unproven, remote monitoring may decrease healthcare utilization through fewer hospital admissions for chronic HF, fewer heart failure-related re-admissions, and more efficient device management. Ongoing trials will assess the clinical utility of such an approach.

Class of recommendation IIb, level of evidence C

Arrhythmias in Heart Failure

The American College of Cardiology/American Heart Association/European Society of Cardiology (ACC/AHA/ESC) Guidelines for management of patients with arrhythmias are applicable to patients with HF. This section emphasizes aspects of management that are particularly relevant in HF.

Table. Management of Patients with Heart Failure and Atrial Fibrillation

General Recommendations

- Precipitating factors and co-morbidities should be identified
- HF treatment should be optimized

Rhythm Control

- Immediate electrical cardioversion is recommended for patients with new-onset AF and myocardial ischaemia, symptomatic hypotension or symptoms of pulmonary congestion or rapid ventricular response not controlled by appropriate pharmacological measures

Rate Control

- Digoxin alone or in combination with beta-blocker is recommended

Prevention of Thromboembolism

- Antithrombotic therapy is recommended, unless contraindicated
- Optimal approach should be based on risk stratification: in patients at highest risk of stroke [prior stroke, transient ischaemic attack (TIA), or systemic embolism] oral anticoagulant therapy with a vitamin K antagonist is recommended

Atrial Fibrillation

AF is the most common arrhythmia in HF. Its onset may lead to worsening of symptoms, an increased risk of thromboembolic complications, and poorer tong-term outcomes. AF may be classified as: first episode, paroxysmal, persistent, or permanent.

- Potential precipitating factors and co-morbidity should be identified and, if possible, corrected (e.g., electrolyte abnormalities, hyperthyroidism, alcohol consumption, mitral valve disease, acute ischaemia, cardiac surgery, acute pulmonary disease, infection, uncontrolled hypertension).
- Background HF treatment should be carefully reevaluated and optimized.
- Management of HF patient with AF, involves three objectives: rate control; correction of the rhythm disturbance, and prevention of thromboembolism.
- Most patients with symptomatic HF are treated with a beta-blocker, and caution is advised when adding an anti-arrhythmic agent.

The following recommendations are particularly applicable for HF patients:

Pharmacological Rate Control during Atrial Fibrillation (see section "Pharmacological Therapy" above)

- A beta-blocker or digoxin is recommended to control the heart rate at rest in patients with HF and LV dysfunction.

Class of recommendation I, level of evidence B

- A combination of digoxin and a beta-blocker may be considered to control the heart rate at rest and during exercise.
- In LV systolic dysfunction, digoxin is the recommended initial treatment in haemodynamically unstable patients.
- Intravenous administration of digoxin or amiodarone is recommended to control the heart rate in patients with AF and HF, who do not have an accessory pathway.

Class of recommendation I, level of evidence B

- In patients with HF and preserved LVEF, a non-dihydropyridine calcium channel antagonist (alone or in combination with digoxin) should be considered to control the heart rate at rest and during exercise.

Class of recommendation IIa, level of evidence C

- Atrioventricular node ablation and pacing should be considered to control the heart rate when other measures are unsuccessful or contraindicated.

Class of recommendation IIa, level of evidence B

Prevention of Thromboembolism (see section "Pharmacological Therapy" above)

- Antithrombotic therapy to prevent thromboembolism is recommended for all patients with AF, unless contraindicated.

Class of recommendation I, level of evidence A

- In patients with AF at highest risk of stroke such as prior thromboembolism, stroke, transient ischaemic attack, or systemic embolism, chronic oral anticoagulant therapy with a vitamin K antagonist to achieve tile target international normalized ratio (INR) of 2.0-3.0 is recommended, unless contraindicated.

Class of recommendation I, level of evidence A

- Anticoagulation is recommended for patients with >1 moderate risk factor. Such factors include: age $\geq$75 years, hypertension, HF, impaired LV function (LVEF $\leq$ 35%), and diabetes mellitus.

Class of recommendation I, level of evidence A

- In patients with HF and AF who do not have any additional risk factor (see above), therapy with either aspirin (81 to 325 mg daily) or a vitamin K antagonist is reasonable for primary prevention of thromboembolism.

Class of recommendation IIa, level of evidence A

Rhythm Control

There is no clear evidence that restoring and maintaining sinus rhythm is superior to rate control in reducing morbidity and mortality in patients with persistent AF and HF.

- Electrical cardioversion is recommended when the rapid ventricular rate does not respond promptly to appropriate pharmacological measures and especially in patients with AF causing myocardial ischaemia, symptomatic hypotension, or symptoms of pulmonary congestion. Precipitating factors should be detected and treated. Transesophageal echocardiography (TOE) may be required to rule out atrial thrombus.

Class recommendation I, level of evidence C

- In patients who require immediate cardioversion because of hydrodynamic instability, the following approach to prevent thromboembolism is recommended:

  If AF is of $\geq$48 hour duration or of unknown duration, heparin by intravenous (i.v.) bolus should be administered followed by a continuous infusion. Subcutaneous, low molecular weight heparin is an acceptable alternative. TOE may be required.

Class recommendation I, level of evidence C

- In patients with AF and HF and/or depressed LV function, the use of antiarrhythmic therapy to maintain sinus rhythm should be restricted to amiodarone.

Class of recommendation I, level of evidence C

- In patients with symptomatic HF and persistent (non-self- terminating) AF, electrical cardioversion should be considered, although its success rate may depend on the duration of arrhythmia and left atrial size.

Class of recommendation lla, level of evidence C

- Administration of i.v. amiodarone is a reasonable option for pharmacological cardioversion of AF, particularly when rapid restoration of sinus rhythm is not required. Patients should be anticoagulated.

Class of recommendation IIa, level of evidence A

- Invasive, catheter-based ablation procedures (pulmonary vein isolation) should be considered in refractory patients but have not been evaluated in clinical trials.

Class of recommendation IIa, level of evidence C

Ventricular Arrhythmias

Ventricular arrhythmias (VAs) are frequent in HF patients, particularly in those with a dilated LV and reduced LVEF. Ambulatory ECG recordings detect premature ventricular complexes in virtually all HF patients, and episodes of asymptomatic, non-sustained VT are common. Complex VA is associated with a poor outcome.

On the basis of existing evidence including recent ACC/AHA/ ESC Guidelines for management of VAs and sudden death, the following recommendations are particularly applicable for HF patients with VA:

- It is essential to detect and, if possible, correct all potential factors precipitating VA. Neurohumoral blockade with optimal doses of beta-blockers, ACEIs, ARBs, and/or aldosterone blockers is recommended.

Class of recommendation I, level of evidence A

- VA may be caused by myocardial ischaemia in HF, and aggressive therapy is essential. Evaluation for CAD and the potential for revascularization is recommended in high-risk patients.

Class of recommendation I, level of evidence C

- Routine, prophylactic use of antiarrhythmic agents in patients with asymptomatic, non-sustained VA is not recommended. In HF patients, class Ic agents should not be used.

Class of recommendation III, level of evidence B

Patients with Heart Failure and Symptomatic VA (see section "Devices and Surgery" above)

- In patients who survived VF or had a history of haemodynamically unstable VT or VT with syncope, with reduced LVEF (<40%), receiving optimal pharmacological treatment and with a life expectancy of >1 year, ICD implantation is recommended.

Class of recommendation I, level of evidence A

- Amiodarone is recommended in patients with an implanted ICD, otherwise optimally treated, who continue to have symptomatic VA.

Class of recommendation I, level of evidence C

- Catheter ablation is recommended as an adjunct therapy in patients with an ICD implanted who have recurrent symptomatic VT with frequent shocks that is not curable by device reprogramming and drug therapy.

Class of recommendation I, level of evidence C

- Amiodarone may be considered as an alternative to ICD to suppress symptomatic VT in already optimally treated HF patients in whom ICD is not an alternative.

Class of recommendation IIb, level of evidence C

- Amiodarone may be considered in HF patients with ICD implanted who have recurrent symptomatic VT with frequent ICD shocks despite optimal therapy- to prevent discharge.

Class of recommendation IIb, level of evidence C

- Electrophysiological evaluation and catheter ablation techniques may be considered in patients With HF and serious VA refractory to management.

Class of recommendation IIb, level of evidence C

Bradycardia

The indications for pacing in patients with HF are similar to those of other patients. These recommendations are detailed in the ESC Guidelines on pacing and further discussed in the "Devices and Surgery" section of these guidelines. Several points specifically related to patients with HF deserve mention.

- Physiological pacing to maintain an adequate chronotropic response and maintain atrial-ventricular coordination with a DDD system is preferable to VVI pacing in patients with HF.
- The indications for an ICD, CRT-P, or CRT-D device should be detected and evaluated in patients with HF prior to implantation of a pacemaker for an AV conduction defect.
- Right ventricular pacing may induce dyssynchrony and worsen symptoms.
- Pacing in order to permit initiation or titration of beta-blocker therapy in the absence of conventional indications is not recommended.

Co-morbidities and Special Populations

Hypertension, CAD, and valvular dysfunction are frequently causal risk factors for HF or may co-exist with another primary aetiology. It is useful to highlight aspects of these conditions that may influence diagnosis, treatment and prognosis in patients with HF (See section "Devices and Surgery" above).

Arterial Hypertension

- Treatment of hypertension substantially reduces the risk of developing HF. Optimal values have not been established, but according to the current European Society of Hypertension (ESH)/ESC Guidelines target BP: (i) should be reduced to at least below 140/90 mmHg (systolic/diastolic), and to lower values if tolerated, in all hypertensive patients and (ii) should be <130/80 mmHg in diabetics and other high risk patients, such as those with evidence of target organ damage (stroke, MI, renal dysfunction, proteinuria).

Class of recommendation I, level of evidence A

Table. Management of Arterial Hypertension in Patients with Heart Failure

In hypertensive patients with evidence of LV dysfunction

- Systolic and diastolic blood pressure should be carefully controlled with a therapeutic target of $\leq$140/90 and $\leq$130/80 mmHg in diabetics and high risk patients
- Anti-hypertensive regimens based on renin-angiotensin system antagonists (ACEIs or ARBs) are preferable

In hypertensive patients with HFPEF

- Aggressive treatment (often with several drugs with complementary mechanisms of action) is recommended
- ACEIs and/or ARBs should be considered the first-line agents

Diabetes Mellitus (DM)

Key Points

- DM is a major risk factor for the development of cardiovascular disease and HF.
- ACEIS and ARBS can be useful in patients with DM to decrease the risk of end-organ damage and cardiovascular complications and subsequently risk of HF.

Class of recommendation IIa, level of evidence A for ACEI and C for ARB

Management of DM in Patients with HF

The recommendations in the ESC/EASD Guidelines for the management of DM apply to most patients with HF. In HF the following specific issues are of special interest:

- All patients should receive lifestyle recommendations.

Class of recommendation I, level of evidence A

- Elevated blood glucose should be treated with tight glycaemic control.

Class of recommendation IIa, level of evidence A

- Oral antidiabetic therapy should be individualized.

Class of recommendation I, level of evidence B

- *Metformin* should be considered as a first-line agent in over-weight patients with type II DM without significant renal dysfunction (GFR >30 mL/min).

Class of recommendation IIa, level of evidence B

- *Thiazolidinediones* have been associated with increased peripheral oedema and symptomatic HF. The risk of developing oedema with thiazolidinediones is dose related and higher in diabetic patients who are taking concomitant insulin therapy. They are therefore contraindicated in HF patients with NYHA functional class III-IV, but may be considered in patients with NYHA functional class I-II with careful monitoring for fluid retention.

Class of recommendation IIb, level of evidence B

- Early initiation of insulin may be considered if glucose target cannot be achieved.

Class of recommendation IIb, level of evidence C

- Agents with documented effects on morbidity and mortality such as ACEIs, beta-blockers, ARBs, and diuretics confer benefit at least comparable with that demonstrated in non-diabetic HF patients.

Class of recommendation I, level of evidence A

- Evaluation of the potential for revascularization may be particularly important in patients with ischaemic cardiomyopathy and DM.

Class of recommendation IIa, level of evidence C

Renal Dysfunction

Key Points

- Renal dysfunction is common in HF, and the prevalence increases with HF severity, age, a history of hypertension, or DM.
- In HF, renal dysfunction is strongly linked to increased morbidity and mortality.
- The cause of renal dysfunction should always be sought in order to detect potentially reversible causes such as hypotension, dehydration, deterioration in renal function due to ACEIs, ARBs, or other concomitant medications (e.g., nonsteroidal anti-inflammatory drugs [NSAIDs]), and renal artery stenosis.

Management of Heart Failure Patients with Renal Dysfunction

Therapy in HF patients with concomitant renal dysfunction is not evidence-based, as these patients are not adequately represented in RCTs in HF (see section "Pharmacological Therapy" above). The following specific issues are of interest:

- Therapy with an ACEI or ARB is usually associated with a mild deterioration in renal function as evidenced by some increase in blood urea nitrogen and creatinine levels and a decrease in estimated GFR. These changes are frequently transient and reversible. Patients with pre-existing renal insufficiency or renal artery stenosis are at a higher risk. If renal deterioration continues, other secondary causes such as excessive diuresis, persistent

hypotension, other nephrotoxic therapies, or concurrent reno-vascular disease should be excluded.
- There is no absolute level of creatinine which precludes the use of ACEIs/ARBs. However, if the serum creatinine level is >250 micromol/L (~2.5 mg/dL), specialist supervision is recommended. In patients with a serum creatinine > 500 micromol/L (~5 mg/dL), haemofiltration or dialysis may be needed to control fluid retention and treat uraemia.
- Aldosterone antagonists should be used with caution in patients with renal dysfunction as they may cause significant hyperkalaemia.
- HF patients with renal dysfunction often have excessive salt and water retention, which require more intensive diuretic treatment. In patients with a creatinine clearance <30 mL/min, thiazide diuretics are ineffective and loop diuretics are preferred.
- Renal dysfunction is associated with impaired clearance of many drugs (e.g., digoxin). To avoid toxicity, the maintenance dose of such drugs should be reduced and plasma levels monitored.

Chronic Obstructive Pulmonary Disease (COPD)

Key Points

- COPD is a frequent co-morbidity in HF, and the prevalence ranges between 20% and 30%. Restrictive and obstructive pulmonary abnormalities are common.
- COPD patients have a markedly elevated risk of HF, and COPD is a strong and independent risk factor for cardiovascular morbidity and mortality. Co-existing COPD further worsens prognosis in HF patients.
- Diagnostic assessment of HF in the presence of COPD is challenging in clinical practice. There is a significant overlap in the signs and symptoms with a relatively lower sensitivity of diagnostic tests such as chest x-ray, ECG, echocardiography, and spirometry.
- Evaluation of natriuretic peptide (B-type natriuretic peptide [BNP] or N-terminal pro B-type natriuretic peptide [NT-proBNP]) levels may be helpful in this population, but the results are often intermediate. The negative predictive value may be most useful.
- Accurate quantification of the relative contribution of cardiac and ventilatory components to the disability of the patient is difficult but may be the key to optimal management. It is essential to detect and treat pulmonary congestion.
- Agents with documented effects on morbidity and mortality such as ACEIs, beta-blockers, and ARBs are recommended in patients with co-existing pulmonary disease.
- The majority of patients with HF and COPD can safely tolerate beta-blocker therapy. Initiation at a low dose and gradual up-titration is recommended. Mild deterioration in pulmonary function and symptoms should not lead to prompt discontinuation. If symptoms worsen, a reduction of the dosage or withdrawal may be necessary. Selective beta-blocker may be the preferable option.
- A history of asthma should be considered a contraindication to the use of any beta-blocker. Inhaled beta-agonists should be administered as required in patients with COPD.

- Co-existence of COPD and HF may dramatically reduce exercise tolerance. Supervised rehabilitation programmes may be appropriate to improve skeletal muscle function and fatigue.

Anaemia

- The reported prevalence of anaemia in HF ranges widely from 4% to 70% due to a lack of an established, consistent definition of anaemia in HF. The prevalence of anaemia increases with HF severity, advanced age, female gender, renal disease, and other co-morbidities.
- Anaemia in patients with HF is frequently associated with a substantially decreased aerobic capacity, a subjective experience of fatigue and reduced functional status, and poor quality of life. Anaemia has been consistently shown to be an independent risk factor for hospital admission and mortality. The most important underlying causes include haemodilution, renal dysfunction, malnutrition, chronic inflammation, impaired bone marrow function, iron deficiency, and drug therapy.
- Anaemia may aggravate the psychophysiology of HF by adversely affecting myocardial function, activating neurohormonal systems, compromising renal function, and contributing to circulatory failure.
- Correction of anaemia has not been established as routine therapy in HF. Simple blood transfusion is not recommended to treat the anaemia of chronic disease in HF. Among potential therapies, the use of erythropoietin-stimulation agents, usually together with iron, to increase red blood cell production represents an unproven option.

Cachexia

- Body wasting is a serious complication of HF, which may affect 10-15% of CHF patients during the natural course of the disease. This is a generalized process that encompasses loss in all body compartments (i.e., lean tissue [skeletal muscle], fat tissue [energy reserves], and bone tissue [osteoporosis]). Cachexia can be defined as an involuntary non-oedematous weight loss of $\geq$6% of total body weight within the last 6-12 months.
- Pathophysiology of cachexia in the HF syndrome still remains unclear, and poor nutrition, malabsorption, impaired calorie and protein balance, hormone resistance, proinflammatory immune activation, neurohormonal derangements, and depletion in anabolic drive may be operative.
- Cachexia usually coincides with severe symptoms of dyspnoea and weakness with a poor quality of life. Wasting is also related to very poor outcome. The mortality of cachectic HF patients is higher than in most malignant disease.
- It has not yet been established whether prevention and treatment of cachexia complicating HF should be a treatment goal. Options include hypercaloric feeding, appetite stimulants, exercise training, and anabolic agents (insulin, anabolic steroids).

Gout

- Patients with HF are prone to develop hyperuricaemia as result of loop diuretic therapy use and renal dysfunction. Hyperuricaemia confers a poor prognosis in HF. In acute gout a short course of colchicine to suppress pain and inflammation may be considered. NSAIDs should be avoided, if possible,

in symptomatic patients. Prophylactic therapy with a xanthine oxidase inhibitor (allopurinol) is recommended to prevent recurrence.

Adults with Congenital Heart Disease

- In children, heart failure is most often related to high-output situations due to intracardiac shunting. This is less frequently observed in adults. Complex lesions associated with cyanosis secondary to impaired pulmonary perfusion may make the diagnosis of HF difficult. Therefore, natriuretic peptide measurement should be included regularly in these patients. Eisenmenger patients represent special problems with associated right ventricular failure and reduced preload of the LV during exercise. Fontan patients are unable to increase pulmonary perfusion. Many of these patients benefit from afterload reduction even before significant HF symptoms are clinically manifest.

The Elderly

- Most clinical trials have included younger patients with a mean age of ~61 years, and commonly 70% of patients have been male. Half of the patients with HF in the population are >75 years in age, and only in younger age groups do males predominant. HF with a preserved EF is more common in the elderly and in females.
- HF in the elderly is frequently underdiagnosed, as cardinal symptoms of exercise intolerance are often attributed to ageing, co-existing co-morbidities, and poor health status. Common co-morbidities may be had an impact on management, include renal failure, diabetes, stroke, cognitive impairment, and COPD.
- Polypharmacy increases the risk of adverse interactions and side-effects which may reduce compliance. Altered pharmacokinetic and pharmacodynamic properties of drugs must always be considered. Impairment of renal function is a natural consequence of ageing. Therefore, dosages of ACEIs, ARBs, spironolactone, and digoxin may need adjustment.
- For elderly HF patients suffering from cognitive impairment, individually structured multidisciplinary HF programmes may be particularly useful and may improve adherence to therapy and prevent hospitalization.
- Relative contraindications to diagnostic procedures and interventions should be carefully evaluated and weighed against the indications.

Acute Heart Failure

Definition

Acute heart failure (AHF) is defined as a rapid onset or change in the signs and symptoms of HF, resulting in the need for urgent therapy. AHF may be either new HF or worsening of pre-existing chronic HF. Patients may present as a medical emergency such as acute pulmonary oedema.

Clinical Classification

The clinical presentation of AHF reflects a spectrum of conditions, and any classification will have its limitation. The patients with AHF will usually present in

one of six clinical categories. Pulmonary oedema may or may not complicate the clinical presentation. Figure 3 in the original guideline document demonstrates the potential overlap between these conditions.

- Worsening or decompensated chronic HF
- Pulmonary oedema
- Hypertensive HF
- Cardiogenic shock
- Isolated right HF
- ACS and HF

Diagnosis of Acute Heart Failure

The diagnosis of AHF is based on the presenting symptoms and clinical findings. Confirmation and refinement of the diagnosis is provided by appropriate investigations such as the history, physical examination, ECG, chest x-ray, echocardiography, and laboratory investigation, with blood gases and specific biomarkers. The diagnostic algorithm is similar for AHF developing *de novo* or as an episode as decompensation in chronic HF.

Initial Evaluation

Systematic assessment of the clinical presentation is essential, with a focused history and appropriate physical examination. Assessment of peripheral perfusion, skin temperature, and venous filling pressures are important. Cardiac auscultation for systolic and diastolic murmurs as well as a third and forth heart sounds (S3, S4) should be performed. Mitral insufficiency is extremely common in the acute phase. Significant aortic stenosis or insufficiency should be detected. Pulmonary congestion is detected by chest auscultation, with the presence of bibasal rales often with bronchial constriction over lung fields usually indicating raised left heart filling pressure. Right heart filling pressures are assessed by evaluating jugular venous filling. Pleural effusions are common in acutely decompensated chronic HF.

The following investigations are considered appropriate in patients with AHF. However, the recommendations largely represent expert consensus opinion without adequate documented evidence. **Class of recommendation I, level of evidence C** applies unless otherwise stated.

Electrocardiogram (ECG)

The ECG provides essential information regarding heart rate, rhythm, conduction, and frequently aetiology. The ECG may indicate ischaemic ST segment changes suggestive of ST-segment elevation myocardial infarction (STEMI) or non-STEMI. Q waves indicate previous transmural infarction. Evidence of hypertrophy, bundle branch block, electrical dyssynchrony, prolonged QT interval, dysrhythmia, or perimyocarditis should be sought.

Chest X-ray

Chest X-ray should be performed as soon as possible at admission for all patients with AHF to assess the degree of pulmonary congestion and to evaluate other

pulmonary or cardiac conditions (cardiomegaly, effusion, or infiltrates). The limitations of a supine film in an acutely ill patient should be noted.

Arterial Blood Gas Analysis

Arterial blood gas analysis enables assessment of oxygenation (pO_2), respiratory function (pCO_2), and acid-base balance (pH), and should be assessed in all patients with severe respiratory distress.

Laboratory Tests

Initial diagnostic evaluation of patients with AHF includes full blood count, sodium, potassium, urea, creatinine, glucose, albumin, hepatic enzymes, and international normalized ratio (INR). Low sodium and high urea and creatinine serum levels are adverse prognostic factors in AHF. A small elevation in cardiac troponin may be seen in patients with AHF without ACS. Elevated troponin compatible with ACS is associated with an adverse prognosis.

Natriuretic Peptides

B-type natriuretic peptides (BNP and NT-proBNP) taken in the acute phase have a reasonable negative predictive value for excluding HF, although the evidence for this practice is not as extensive as with chronic HF.

Echocardiography

Echocardiography with Doppler is an essential tool for the evaluation of the functional and structural changes underlying or associated with AHF. All patients with AHF should be evaluated as soon as possible. The findings will frequently direct treatment strategy.

Instrumentation and Monitoring of Patients in Acute Heart Failure

Monitoring of the patient with AHF should be started as soon as possible after the arrival at the emergency unit, concurrent with ongoing diagnostic measures focused on determining the primary aetiology as well as the response to the initial treatment strategy.

Non-Invasive Monitoring

In all critically ill patients, monitoring the routine basic observations of temperature, respiratory rate, heart rate, BP, oxygenation, urine output, and the electrocardiogram is mandatory. A pulse oximeter should be used continuously in any unstable patient who is being treated with a fraction of inspired oxygen (FiO_2) that is greater than air, and the values recorded at regular intervals in patients receiving oxygen therapy for AHF.

Invasive Monitoring

<u>Arterial Line</u>

The indications for the insertion of an arterial catheter are the need for either continuous analysis of arterial BP due to haemodynamic instability, or the requirement for frequent arterial blood samples.

Class of recommendation IIa, level of evidence C

Central Venous Lines

Central venous lines provide access to the central circulation and are therefore useful for the delivery of fluids and drugs, and monitoring of the central venous pressure (CVP) and venous oxygen saturation (SVO_2), which provides an estimate of the body oxygen consumption/delivery ratio.

Class of recommendation IIa, level of evidence C

Pulmonary Artery Catheter

The insertion of a pulmonary artery catheter (PAC) for the diagnosis of AHF is usually unnecessary. A PAC can be useful to distinguish between a cardiogenic and non-cardiogenic mechanism in complex patients with concurrent cardiac and pulmonary disease, especially when echo/Doppler measurements are difficult to obtain. A PAC may be useful in haemodynamically unstable patients who are not responding as expected to traditional treatments.

The complication rate following insertion of a PAC increases with the duration of its utilization. It is critical to have clear objectives prior to insertion of the catheter. Pulmonary capillary wedge pressure is not an accurate reflection of LV end-diastolic pressure in patients with mitral stenosis, aortic regurgitation, pulmonary venous occlusive disease, ventricular interdependence, high airway pressure, respirator treatment, or a poorly compliant LV. Severe tricuspid regurgitation, frequently found in patients with AHF, can make the estimate of cardiac output measured by thermodilution unreliable.

Class of recommendation IIb, level of evidence B

Coronary Angiography

In cases of AHF and evidence of ischaemia such as unstable angina or ACS, coronary angiography is indicated in patients without strong contraindications. Revascularization options (PCI/CABG) should be considered if technically possible in appropriate patients with an acceptable risk profile. Successful reperfusion treatment has been shown to improve prognosis.

Class of recommendations I, level of evidence B

Since the majority of patients presenting with AHF have CAD, diagnosing CAD is important for decisions concerning medical therapy such as IIb/IIIa glycoprotein antagonists, oral antiplatelet agents, statins, and potential revascularization.

Organization of Acute Heart Failure Treatment

The immediate goals are to improve symptoms and to stabilize the haemodynamic condition (see *Table 27* and *Figure 6*). Treatment of hospitalized patients with AHF requires a well-developed treatment strategy with realistic objectives and a plan for follow-up that should be initiated prior to discharge. Many patients will require long-term treatment if the acute episode leads to chronic HF. The treatment of AHF should be followed-up by a HF management programme when available as recommended in these guidelines.

Class of recommendations I, level of evidence B

Management

Multiple agents are used to manage AHF, but there is a paucity of clinical trials data and their use is largely empiric. Adequate long-term outcome data are not available. In the published AHF trials, most agents improve haemodynamics but no agent has been shown to reduce morality. Potential limitations in these trials include the heterogeneous populations studied and the delay between hospital presentation and therapeutic intervention.

The following management options are considered appropriate in patients with AHF. However, the recommendations largely represent expert consensus opinion without adequate documentation from randomization clinical trials. Therefore, **level of evidence C** applies unless otherwise stated.

Oxygen

It is recommended to administer oxygen as early as possible in hypoxaemic patients to achieve an arterial oxygen saturation $\geq$95% (>90% COPD patients). Care should be taken in patients with serious obstructive airways disease to avoid hypercapnia.

Class of recommendation I, level of evidence C

Non-Invasive Ventilation

Indications

Non-invasive ventilation (NIV) refers to all modalities that assist ventilation without the uses of an endotracheal tube but rather with a sealed face-mask. NIV with positive end-expiratory pressure (PEEP) should be considered as early as possible in every patient with acute cardiogenic pulmonary oedema and hypertensive AHF as it improves clinical parameters including respiratory distress NIC with PEEP improves LV function by reducing LV afterload. NIV should be used with caution in cardiogenic shock and right ventricular failure.

Class of recommendation IIa, level of evidence B

Contraindications

- Patients who cannot cooperate (unconscious patients, severe cognitive impairment, or anxiety)

- Immediate need of endotracheal intubation due to progressive life-threatening hypoxia
- Caution in patients with severe obstructive airways disease

Morphine and Its Analogues in Acute Heart Failure

Morphine should be considered in the early stage of treatment of patients admitted with severe AHF especially if they present with restlessness, dyspnoea, anxiety, or chest pain.

Loop Diuretics

Indications

- Administration of i.v. diuretics is recommended in AHF patients in the presence of symptoms secondary to congestion and volume overload (see Table 28 in the original guideline document).

Class of recommendation I, level of evidence B

Refer to the original guideline document for dosing information.

Vasodilators

Vasodilators are recommended at an early stage for AHF patients without symptomatic hypotension, systolic blood pressure (SBP) <90 mmHg or serious obstructive valvular disease. The recommended dosage of vasodilators is presented in Table 29 of the original guideline document.

Class of recommendation I, level of evidence B

Inotropic Agents

Inotropic agents should be considered in patients with low output states, in the presence of signs of hypoperfusion or congestion despite the use of vasodilators and/or diuretics to improve symptoms. Figure 7 (in the original guideline document) describes a treatment algorithm based on the level of SBP, and Figure 8 (in the original guideline document) describes the treatment algorithm based on a clinical assessment of patients filling pressures and perfusion.

Class of recommendation IIa, level of evidence B

Indications for Inotropic Therapy

Inotropic agents should only be administered in patients with low SBP or low measured cardiac index in the presence of signs of hypoperfusion or congestion.

When needed, inotropic agents should be administered as early as possible and withdrawn as soon as adequate organ perfusion is restored and/or congestion reduced.

Continuous clinical monitoring and ECG telemetry is required.

Dobutamine

Dobutamine, a positive inotropic agent acting through stimulation of $beta_1$-receptors to produce dose-dependent positive inotropic and chronotropic effects, is usually initiated with 2-3 micrograms/kg/min infusion rate without a loading dose. The infusion rate may then be progressively modified according to symptoms, diuretic response, or clinical status. Its haemodynamic action are dose-related, which can be increased to 15 micrograms/kg/min. BP should be monitored, invasively or non-invasively. In patients receiving beta-blocker therapy, dobutamine doses may have to be increased to as high as 20 micrograms/kg/min to restore its inotropic effect. The elimination of the drug is rapid after cessation of infusion. Care should be exercised in weaning patients from dobutamine infusion. Gradual tapering (i.e., decrease in dosage by steps of 2 micrograms/kg/min) and simultaneous optimization of oral therapy are essential.

Class of recommendation IIa, level of evidence B

Dopamine

Dopamine, which also stimulates beta-adrenergic receptors both directly and indirectly with a consequent increase in myocardial contractility and cardiac output, is an additional inotropic agent. Infusion of low doses of dopamine ($\leq$2-3 micrograms/kg/min) stimulates dopaminergic receptors but has been shown to have limited effects on diuresis. Higher doses of dopamine may be used to maintain SBP, but with an increasing risk of tachycardia, arrhythmia, and alpha-adrenergic stimulation with vasoconstriction. Dopamine and dobutamine should be used with caution in patients with a heart rate >100 b.p.m. The alpha stimulation at higher doses may lead to vasoconstriction and elevated systemic vascular resistance. Low-dose dopamine is frequently combined with higher doses of dobutamine.

Class of recommendation IIb, level of evidence C

Milrinone and Enoximone

Milrinone and enoximone are the two type III phosphodiesterase inhibitors (PDEIs) used in clinical practice. The agents inhibit the breakdown of cyclic adenosine monophosphate (AMP) and have inotropic and peripheral vasodilating effects, with an increase in cardiac output and stroke volume, and a concomitant decline in pulmonary artery pressure, pulmonary wedge pressure, and systemic and pulmonary vascular resistance. As their cellular site of action is distal to the beta-adrenergic receptors, the effects of PDEI are maintained during concomitant beta-blocker therapy. Milrinone and enoximone are administered by a continuous infusion possibly preceded by a bolus dose in patients with well-preserved BP. Caution should be used in the administration of PDEIs in patients with CAD, as it may increase medium-term mortality.

Class of recommendation IIb, level of evidence B

Levosimendan

Levosimendan is a calcium sensitizer that improves cardiac contractility by binding to troponin-C in cardiomyocytes. It exerts significant vasodilatation mediated through adenosine triphosphate (ATP)-sensitive potassium channels and has mild PDE inhibitory action. Levosimendan infusions in patients with acutely decompensated HF increases cardiac output and stroke volume and reduces pulmonary wedge pressure, systemic vascular resistance, and pulmonary vascular resistance. The haemodynamic response to levosimendan is maintained over several days. Levosimendan may be effective in patients with decompensated chronic HF. In that the inotropic effect is independent of beta-adrenergic stimulation, it represents an alternative for patients on beta-blocker therapy. Levosimendan treatment is associated with a slight increase in heart rate and a decrease in the BP, especially if a loading dose is administered.

Levosimendan may be administered as a bolus dose (3-12 micrograms/kg/min) during 10 min followed by a continuous infusion (0.05-0.2 micrograms/kg/min for 24 hours). The infusion rate may be increased once stability is confirmed. In patients with SBP <100 mmHg, the infusion should be started without a bolus dose to avoid hypotension.

Class of recommendation IIa, level of Evidence B

Vasopressors

Vasopressors (norepinephrine) are not recommended as first-line agents and are only indicated in cardiogenic shock when the combination of an inotropic agent and fluid challenge fails to restore SBP >90 mmHg, with inadequate organ perfusion, despite an improvement in cardiac output. Patients with sepsis complicating AHF may require a vasopressor. Since cardiogenic shock is usually associated with a high risk systemic vascular resistance, all vasopressors should be used with caution and discontinued as soon as possible. Noradrenaline might be used with any of above-mentioned inotropic agents in cardiogenic shock, ideally perfused through a central line. Caution is advised with dopamine that already exerts a vasopressor effect. Epinephrine is not recommended as an inotrope or vasopressor in cardiogenic shock and should be restricted to use as rescue therapy in cardiac arrest.

Class of recommendation IIb, level of evidence C

Cardiac Glycosides

In AHF, cardiac glycosides produce a small increase in cardiac output and a reduction of filling pressures. It may be useful to slow ventricular rate in rapid AF.

Class of recommendation IIb, level of evidence C

Algorithm for Acute Heart Failure Management

After the initial assessment, all patients should be considered for oxygen therapy and NIV. The goal of treatment in the pre-hospital setting or at the emergency

room is to improve tissue oxygenation and optimize haemodynamics in order to improve symptoms and permit interventions (see Figure 6 in the original guideline document). A specific treatment strategy should be based on distinguishing the clinical conditions as described below:

- **Decompensated chronic HF**: Vasodilators along the loop diuretics are recommended. Consider higher dose of diuretics in renal dysfunction or with chronic diuretic use. Inotropic agents are required with hypotension and signs of organ hypoperfusion.
- **Pulmonary oedema**: Morphine is usually indicated especially when dyspnoea is accompanied by pain and anxiety. Vasodilators are recommended when BP is normal or high, and diuretics in patients with volume overload or fluid retention. Inotropic agents are required with hypotension and signs of organ hypoperfusion. Intubation and mechanical ventilation may be required to achieve adequate oxygenation.
- **Hypertensive HF**: Vasodilators are recommended with close monitoring and low-dose diuretic treatment in patients with volume overload or pulmonary oedema.
- **Cardiogenic shock**: A fluid challenge if clinically indicated (250 mL/10 min) followed by an inotrope if SBP remains <90 mmHg is recommended. If the inotropic agent fails to restore SBP and signs of organ hypoperfusion persist, norepinephrine may be added with extreme caution. An intra-aortic balloon pump (IABP) and intubation should be considered. LVADs may be considered for potentially reversible causes of acute HF as a bridge to treatment response (i.e. surgery or recovery).
- **Right HF**: A fluid challenge is usually ineffective. Mechanical ventilation should be avoided. Inotropic agents are required when there are signs of organ hypoperfusion. Pulmonary embolism and right ventricular MI should be suspected.
- **AHF and ACS**: All patients with ACS and signs and symptoms of HF should undergo an echocardiographic study to assess systolic and diastolic ventricular function, valvular function, and rule out other cardiac abnormalities or mechanical complications of MI.

Class of recommendation I, level of evidence C

In ACS complicated by AHF, early reperfusion may improve prognosis. If neither PCI nor surgery is readily available or can only be provided after a delay, early fibrinolytic therapy is recommended in patients with STEMI. Urgent surgery is indicated in patients with mechanical complications after acute myocardial infarction (AMI). In cardiogenic shock caused by ACS, insertion of an IABP, coronary angiography, and revascularization (primary PCI) should be considered as soon as possible.

Class of recommendation I, level of evidence C

Management of Patients with Acutely Decompensated Chronic Heart Failure Treated with Beta-Blockers and ACEIs/ARBs

ACEIs are not indicated in the early stabilization of patients with AHF. However, as these patients are at high risk for development of chronic HF, ACEIs/ARBs have an important role in early management of AHF patients and acute MI, particularly in

the presence of HF and/or evidence of LV systolic dysfunction. These agents attenuate remodeling, and reduce morbidity and mortality. There is no consensus on the ideal timing for initiation of ACEI/ARB therapy in AHF. In general, it is recommended that treatment with these agents should be initiated before discharge from hospital. Patients on ACEIs/ARBs admitted with worsening HF should be continued on this treatment whenever possible.

Class of recommendation I, level of evidence A

In patients with acutely decompensated HF, the dose of beta-blocker may need to be reduced temporarily or omitted, although generally treatment should not be stopped, unless the patient is clinically unstable with signs of low output. Treatment may be interrupted or reduced in the presence of complications (bradycardia, advanced AV block, bronchospasm, or cardiogenic shock) or in cases of severe AHF and an inadequate response to initial therapy. In patients following an AMI, with symptoms of HF or evidence of LV dysfunction, beta-blockers should also be initiated early and preferably prior to discharge. In patients admitted with AHF, beta-blockers should be considered when the patient has been stabilized on an ACEI or ARB and preferably initiated before hospital discharge.

Class of recommendation IIa, level of evidence B

Implementation and Delivery of Care

Management of patients with HF exemplifies the relevance of a shift of the emphasis of management away from acute and subacute episodes of illness toward chronic conditions where the nature of professional and patient transitions is distinctly different. Table 31 in the original guideline document summarizes the goals and measures involved during potential phases of this transition.

Heart Failure Management Programmes

- Heart failure management programmes are recommended for patients with HF recently hospitalized and for other high-risk patients.

Class of recommendation I, level of evidence A

If possible, patients should learn to recognize symptoms and practice self-care measures (see section "Non-pharmacological Management" above). Nurses are often involved in drug titration, and titration protocols and treatment algorithms should be employed. Programmes may also be involved in the management of patients with an implanted device (CRT/ICD). Increased access to care through daily telephone hours to a HF nurse provides reassurance and allows patients the opportunity to discuss symptoms, treatment, side-effects, and self-care behaviour. Contact with the programme can be initiated during hospitalization, at discharge, during the first weeks after discharge, or as a request for consultation from primary care.

It is recommended that HF management programmes include the components shown in the table below. Adequate education is essential. Remote management

is an emerging field within the broader context of HF management programmes, and extends the reach of individualized care to the large group of individuals unable to access traditional programmes of care.

Table. Recommended Components of Heart Failure Management Programmes

- Multidisciplinary approach frequently led by HF nurses in collaboration with physicians and other related services
- First contact during hospitalization, early follow-up after discharge through clinic and home-based visits, telephone support and remote monitoring
- Target high-risk, symptomatic patients
- Increase access to healthcare (telephone, remote monitoring, and follow-up)
- Facilitate access during episodes of decompensation
- Optimized medical management
- Access to advanced treatment options
- Adequate patient education with special emphasis on adherence and self-care management
- Patient involvement in symptom monitoring and flexible diuretic use
- Psychosocial support to patients and family and/or caregiver

Palliative Care for Patients with Heart Failure

- Patients with clinical features of advanced HF who continue to experience symptoms refractory to optimal evidence-based therapy have a poor short-term prognosis and should be considered appropriate for a structured palliative care approach. Psychological symptoms such as anxiety need to be addressed.

Class of recommendation I, level of evidence C

Features that should trigger such consideration and the proposed steps in the process of providing palliative care are presented in the table below.

Table. Goals and Steps in the Process of Providing Palliative Care in Patients with Heart Failure

Patient features	>1 episode of decompensation/6 months despite optimal tolerated therapy Need for frequent or continual IV support Chronic poor quality of life with NYHA IV symptoms Signs of cardiac cachexia Clinically judged to be close to the end of life
Confirm diagnosis	Essential to ensure optimal treatment
Patient education	Principles of self-care maintenance and management of HF

Establish an Advanced Care Plan	Designed with the patient and a family member. Reviewed regularly and includes the patients' preference for future treatment options
Services should be organized	The patients' care within the multidisciplinary team, to ensure optimal pharmacological treatment, self-care management and to facilitate access to supportive services.
Symptom management	Requires frequent assessment of patients' physical, psychological, social and spiritual needs. Patients frequently have multiple co-morbidities that need to be identified.
Identifying end-stage heart failure	Confirmation of end-stage HF is advisable to ensure that all appropriate treatment options have been explored a plan for the terminal stage of illness should be agreed upon.
Breaking bad news to the patient and the family	Explaining disease progression and change in treatment emphasis is a sensitive issue and must be approached with care.
Establishing new goals of care	End-of-life care should include avoidance of circumstances which may detract from a peaceful death. All current pharmacological treatment and devise programmes should be considered. Resuscitation orders should be clear.

Definitions:

Levels of Evidence

Level of Evidence A	Data derived from multiple randomized clinical trials or meta-analyses
Level of Evidence B	Data derived from a single randomized clinical trial or large non-randomized studies
Level of Evidence C	Consensus of opinion of the experts and/or small studies, retrospective studies, registries

Classes of Recommendations

Classes of Recommendations	Definition
Class I	Evidence and/or general agreement that a given treatment or procedure is beneficial, useful, effective
Class II	Conflicting evidence and/or a divergence of opinion about the usefulness/efficacy of the given treatment or procedure
Class IIa	Weight of evidence/opinion is in favour of usefulness/efficacy.
Class IIb	Usefulness/efficacy is less well established by

Classes of Recommendations	Definition
	evidence/opinion
Class III	Evidence or general agreement that the given treatment or procedure is not useful/effective, and in some cases may be harmful.

CLINICAL ALGORITHM(S)

Clinical algorithms are provided in the original guideline document for:

- Diagnosis of heart failure (HF) with natriuretic peptides in untreated patients with symptoms suggestive of HF
- Treatment algorithm for patients with symptomatic HF and reduced ejection fraction
- Evaluation of patients with suspected acute HF (AHF)
- Initial treatment algorithm in AHF
- AHF treatment strategy according to systolic blood pressure
- AHF treatment strategy according to left ventricular filling pressure

EVIDENCE SUPPORTING THE RECOMMENDATIONS

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

Documented and published evidence on diagnosis, efficacy, and safety of therapeutic interventions is the main basis for these guidelines. Where evidence is lacking or does not resolve a clinical issue, a consensus opinion is presented.

The type of supporting evidence is identified and graded for selected recommendations (see "Major Recommendations").

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

Appropriate diagnosis and treatment of acute and chronic heart failure

POTENTIAL HARMS

Adverse Effects of Heart Failure Treatment

Angiotensin-Converting Enzyme Inhibitors (ACEIs)

- Worsening renal function
- Hyperkalemia
- Symptomatic hypotension
- Cough

Beta-Blockers

- Symptomatic hypotension
- Worsening heart failure
- Excessive bradycardia

Aldosterone Antagonists

- Hyperkalaemia
- Worsening renal function
- Breast tenderness and/or enlargement

Angiotensin Receptor Blockers (ARBs)

- Worsening of renal function
- Hyperkalaemia
- Symptomatic hypotension

Hydralazine and Isosorbide Dinitrate

- Symptomatic hypotension
- Arthralgia/muscle aches, joint pain or selling, pericarditis/pleuritis, rash or fever – consider drug-induced lupus-like syndrome

Digoxin

- Sinoatrial and atrioventricular (AV) block
- Atrial and ventricular arrhythmias, especially in the presence of hypokalaemia (digoxin-specific Fab antibody fragments should be considered for ventricular arrhythmias caused by toxicity)
- Signs of toxicity include: confusion, nausea, anorexia, and disturbance of colour vision

Non-Invasive Ventilation

- Worsening of severe right ventricular failure
- Drying of the mucous membranes with prolonged, continuous use
- Hypercapnia
- Anxiety or claustrophobia
- Pneumothorax
- Aspiration

Morphine and Its Analogues

Nausea is common with morphine, and antiemetic therapy may be required. Caution should be used in patients with hypotension, bradycardia, advanced atrioventricular block, or carbon dioxide retention.

Loop Diuretics

- Hypokalaemia, hyponatraemia, hyperuricaemia

- Hypovolaemia and dehydration
- Neurohormonal activation
- May increase hypotension following initiation of ACEI/ARB therapy

Vasodilators

Headache is frequently reported with nitrates. Tachyphylaxis is common after 24 to 48 hours, necessitating incremental dosing with nitrates. Intravenous nitroprusside should be used cautiously in patients with ACS, as abrupt hypotension is not infrequent. Hypotension may also occur with i.v. nitroglycerine or nesiritide infusion.

CONTRAINDICATIONS

CONTRAINDICATIONS

Many medications used in treatment of heart failure are contraindicated during pregnancy.

Contraindications to Angiotensin-Converting Enzyme Inhibitors (ACEIs)

- History of angioedema
- Bilateral renal stenosis
- Serum potassium concentration >5.0 mmol/L
- Serum creatinine >220 micromole/L (~2.5 mg/dL)
- Severe aortic stenosis

Contraindications to Beta-Blockers

- Asthma (chronic obstructive pulmonary disease [COPD] is not a contraindication).
- Second- or third-degree heart block, sick sinus syndrome (in the absence of a permanent pacemaker), sinus bradycardia (<50 b.p.m.)

Contraindications to Aldosterone Antagonists

- Serum potassium concentration >5.0 mmol/L
- Serum creatinine >220 micromol/L (~2.5 mg/dL)
- Concomitant potassium sparing diuretic or potassium supplements
- Combination of an ACEI and angiotensin receptor blocker (ARB)

Contraindications to ARBs

- As with ACEIs, with the exception of antioedema
- Patients treated with an ACEI *and* an aldosterone antagonist
- An ARB should only be used in patients with adequate renal function and normal serum potassium concentration; serial monitoring of serum electrolytes and renal function is mandatory, especially if an ARB is used in conjunction with an ACEI.

Contraindications to Isosorbide Dinitrate and Hydralazine

- Symptomatic hypotension
- Lupus syndrome
- Severe renal failure (dose reduction may be needed)

Contraindications to Digoxin

- Second- or third-degree heart block (without a permanent pacemaker); caution if suspected sick sinus syndrome
- Pre-excitation syndromes
- Previous evidence of digoxin intolerance

Contraindications to Heart Transplantation

- Current alcohol and/or drug abuse
- Lack of proper cooperation
- Serious mental illness not properly controlled
- Treated cancer with remission <5 years follow-up
- Systemic disease with multiorgan involvement active infection
- Significant renal failure (creatinine clearance <50 mL/min)
- Irreversible high pulmonary vascular resistance (6-8 Wood units and mean trans-pulmonary gradient >15 mmHg)
- Recent thromboembolic complications
- Unhealed peptic ulcer
- Evidence of significant liver impairment
- Other serious co-morbidity with a poor prognosis

Contraindications to Thiazolidinediones

Heart failure patients with New York Heart Association (NYHA) functional class III-IV

Contraindications to Non-Invasive Ventilation

- Patients who cannot cooperate (unconscious patients, severe cognitive impairment, or anxiety)
- Immediate need of endotracheal intubation due to progressive life-threatening hypoxia
- Caution in patients with severe obstructive airways disease

QUALIFYING STATEMENTS

QUALIFYING STATEMENTS

- The European Society of Cardiology (ESC) Guidelines represent the view of the ESC and were arrived at after careful consideration of the available evidence at the time they were written. Health professionals are encouraged to take them fully into account when exercising their clinical judgment. The Guidelines do not, however, override the individual responsibility of healthier professionals to make appropriate decisions in the circumstance of the

individual patients, in consultation with that patient, and where appropriate and necessary the patient's guardian or carer. It is also the health professional's responsibility to verify the rules and regulations applicable to drugs and devices at the time of prescription.

- ESC Guidelines are relevant to 51 member states with diverse economies and, therefore, recommendations based on cost-effectiveness have, in general, been avoided. National health policy as well as clinical judgment may dictate the order of priorities in implementation. The recommendations in these guidelines should always be considered in the tight of national policies and local regulatory guidance on the use of any diagnostic procedure, medicine, or device.

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

Refer to the section "Implementation and Delivery of Care" in "Major Recommendations" section of this summary and in the original guideline document for a discussion of heart failure management programs and palliative care for patients with heart failure.

IMPLEMENTATION TOOLS

Clinical Algorithm
Personal Digital Assistant (PDA) Downloads
Pocket Guide/Reference Cards
Slide Presentation
Staff Training/Competency Material

For information about availability, see the "Availability of Companion Documents" and "Patient Resources" fields below.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

End of Life Care
Getting Better
Living with Illness

IOM DOMAIN

Effectiveness
Patient-centeredness

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

Dickstein K, Cohen-Solal A, Filippatos G, McMurray JJ, Ponikowski P, Poole-Wilson PA, Stromberg A, van Veldhuisen DJ, Atar D, Hoes AW, Keren A, Mebazaa A, Nieminen M, Priori SG, Swedberg K, ESC Committee for Practice Guidelines (CPG), Vahanian A, Camm J, De Caterina R, Dean V, Dickstein K, Filippatos G, Funck-Brentano C, Hellemans I, Kristensen SD, McGregor K, Sechtem U, Silber S, Tendera M, Widimsky P, Zamorano JL, Document Reviewers, Tendera M, Auricchio A, Bax J, Bohm M, Corra U, Della Bella P, Elliott PM, Follath F, Gheorghiade M, Hasin Y, Hernborg A, Jaarsma T, Komajda M, Kornowski R, Piepoli M, Prendergast B, Tavazzi L, Vachiery JL, Verheugt FW, Zamorano JL, Zannad F. ESC guidelines for the diagnosis and treatment of acute and chronic heart failure 2008: the Task Force [trunc]. Eur Heart J 2008 Oct;29(19):2388-442. [252 references] PubMed

ADAPTATION

Not applicable: The guideline was not adapted from another source.

DATE RELEASED

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European Society of Cardiology - Medical Specialty Society
Heart Failure Association of the ESC - Disease Specific Society

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FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Statements of conflicts of interests were collected from members of the guideline Writing Group; these statements are available at the European Society of Cardiology (ESC) office.

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Austrian Society of Cardiology - Medical Specialty Society
Belgian Society of Cardiology - Medical Specialty Society
Cardiology Society of Serbia and Montenegro - Medical Specialty Society
European Society of Intensive Care Medicine - Professional Association
French Society of Cardiology - Medical Specialty Society
German Cardiac Society - Medical Specialty Society
Italian Federation of Cardiology - Medical Specialty Society
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Polish Cardiac Society - Medical Specialty Society
Romanian Society of Cardiology - Medical Specialty Society
Slovak Society of Cardiology - Medical Specialty Society
Society of Cardiology of the Russian Federation - Medical Specialty Society
Spanish Society of Cardiology - Medical Specialty Society
Turkish Society of Cardiology - Medical Specialty Society

GUIDELINE STATUS

This is the current release of the guideline.

This guideline updates previous versions: Task Force on Acute Heart Failure of the European Society of Cardiology. Guidelines on the diagnosis and treatment of acute heart failure. Sophia Antipolis (FR): European Society of Cardiology; 2005. 36 p.

Swedberg K, Cleland J, Dargie H, Drexler H, Follath F, Komajda M, Tavazzi L, Smiseth OA, Gavazzi A, Haverich A, Hoes A, Jaarsma T, Korewicki J, Levy S, Linde C, Lopez-Sendon JL, Nieminen MS, Pierard L, Remme WJ. Guidelines for the diagnosis and treatment of chronic heart failure: full text (update 2005): The Task Force for the Diagnosis and Treatment of Chronic Heart Failure of the European Society of Cardiology. Sophia Antipolis (FR): European Society of Cardiology (ESC); 2005. 45 p.

GUIDELINE AVAILABILITY

Electronic copies: Available from the European Society of Cardiology (ESC) Web site.

Print copies: Available from Oxford University Press, Great Clarendon Street, Oxford, OX2 6DP, UK, Tel: +44 (0) 1865 353263, Fax: +44 (0) 1865 353774, Web site: http://www.eurheartj.oxfordjournals.org/.

AVAILABILITY OF COMPANION DOCUMENTS

The following are available:

- Corrigendum to "ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure 2008." 2008. Available in Portable Document Format (PDF) from the European Society of Cardiology (ESC) Web site.
- ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure 2008. Slide set. Available in Portable Document Format (PDF) from the ESC Web site.
- Acute and chronic heart failure. Pocket guidelines. Order form available in Portable Document Format (PDF) from the ESC Web site. Also available for PDA download from the ESC Web site.

Print copies: Available from Oxford University Press, Great Clarendon Street, Oxford, OX2 6DP, UK, Tel: +44 (0) 1865 353263, Fax: +44 (0) 1865 353774, Web site: http://www.eurheartj.oxfordjournals.org/.

Additionally, continuing medical education (CME) credit is available online at the European Society of Cardiology (ESC) Web site.

PATIENT RESOURCES

None available

NGC STATUS

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